

Efficiency of the British  
UMTS Auction: A  
Comment on Börgers and  
Dustmann

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Auction theorists have developed very sophisticated tools to analyze optimal bidding behavior under various informational assumptions and for different auction rules. They have invented several new auction formats with interesting and desirable properties, and they played an important role in designing the auction formats of various large spectrum auctions in the United States and in Europe. Thus, it is often claimed that auction theory is the most spectacular success story of the application of game theory in economics. However, while some (but not all) recent spectrum auctions are generally believed to have been "very successful," it is not clear whether auction theory does accurately describe the actual bidding behavior of the involved players.

Börgers and Dustmann's chapter is one of the very few attempts to take seriously the data generated by a spectrum auction. Using the data on the actual bids in the British UMTS auction, the authors ask whether the observed bidding behavior is consistent with two assumptions, namely that bidders have *private values* and that they use *straightforward bidding* as a bidding strategy. Of course, if the observed behavior was inconsistent with these two assumptions, this would not falsify auction theory. It is conceivable that bidders do not have private values. Even if they do, straightforward bidding is not a dominant strategy and there may be many other equilibria in this game. However, if the observed behavior were consistent with private values and straightforward bidding, then the employed bidding strategies would form an equilibrium that achieves the efficient allocation. Thus, in this case the frequently made claim that the outcome of the British UMTS auction was efficient would be on much safer grounds.

Unfortunately, however, the data are not consistent with private values and straightforward bidding. The authors show that the behavior of several bidders—in particular, that of BT3G, TIW and NTL

Mobile—cannot be reconciled with these assumptions. From this, Börgers and Dustmann conclude in chapter 8 that, as a consequence, they are cautious regarding the success of the auction in achieving an efficient allocation of licenses.

There are several possible reasons why the outcome of the auction may have been inefficient.<sup>1</sup> Some of these reasons have little to do with the rules of the auction but are related to the (imperfect) environment in which the auction has been conducted:

- It could have been inefficient to divide the spectrum in this particular way. However, the decision on the division of the spectrum was taken at a political or perhaps technical level, and there is nothing that the auction itself could have done about it. This is why Börgers and Dustmann are right to take the form of the licenses as given.
- It may have been the case that the involved companies had incorrect or inconsistent valuations for the licenses, for example, because of bounded rationality or because of principal-agent problems or collective decision-making problems within the firms. This argument is very plausible, but it is not clear whether the auction format could or should be used to solve these internal problems of the involved companies.
- It is possible that some bidders were forced to quit the auction before the price reached their valuation because of credit constraints. This is true, but, again, the question arises whether the auction format could and should be used to correct market failures of other markets. If credit constraints are a problem, it seems preferable for the government to deal directly with this problem, say, by offering loans at a reasonable interest rate to all participating bidders, but it should not tamper with the rules of the auction.

It is more interesting to ask whether the rules of the auction themselves could have induced an inefficient allocation. In principle, this cannot be ruled out, but a closer look at the data shows that this is rather unlikely:

- It could have been the case that some bidders had private information about future market demand for 3G telecommunication services or that there was some other common value component present. However, Börgers and Dustmann argue in chapter 8 that “it does not seem plausible that at the time of the auction any one bidder had highly significant private information” (135) and that if such an effect was present, then it is likely to be of minor quantitative importance. In Börgers

and Dustmann (2002) the authors point out: “At the time of the U.K. auction there had been long public discussions about the future potential of the UMTS technology, and about possible customers’ demand for UMTS products. Clearly, these discussions had left a huge amount of uncertainty. However, it seems well possible that all relevant information had already reached the public domain, and that no firm had important insider information, except for information that concerned only its own situation, with no immediate relevance for other firms. If that is correct, then the private value assumption may well be a valid approximation” (14).

• Allocative externalities could have caused an inefficient allocation. However, Börgers and Dustmann (chapter 8) argue convincingly that allocative externalities did not leave any obvious footprints in the data and are unlikely to have played a significant role.

• The outcome would be inefficient if one bidding firm dropped out of the auction, even though it had a valuation for at least one of the licenses that was larger than the final price of that license (and larger than the valuation of the successful bidder for this license). If the firm is not credit constrained, this can happen only if it uses a strictly dominated strategy, namely, to drop out even though there was still a chance to obtain one of the licenses at a price lower than its reservation value. This dominance argument is easy to understand, and it seems unlikely that any firm used such a strictly dominated strategy.

• The outcome would be inefficient if one firm got stuck with one type of license and had to buy it, even though its incremental valuation for some other license was larger than the price difference to this other license. To see this, consider the following example in which there are just the two licenses B and C: (1) BT3G has valuations (150, 100) for these licenses and placed a bid of 95 on license C; and (2) Vodafone has valuations (140, 92) and placed a bid of 135 on license B. Suppose that the bidding stops at this point. Note that in this case it would be more efficient if BT3G owned license B and Vodafone owned license C.

In fact, BT3G would like to make a bid of 136 on license B, but it cannot do so because it has to stick to license C until there is another bidder who takes over this license.

Is it likely that this has happened? Consider first the bidding for license B. In Phase 3 BT3G placed six bids, only one of which was for license B. After BT3G was outbid by Vodafone on license B, it made three other bids for the smaller licenses. So it was not stuck with a

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small license in the very end, but it could have chosen at least three times to outbid Vodafone on license B. If BT3C did not do so, then this seems to be a strong indication that they did not want to do so because it would not have paid off.

A similar argument can be made for license A: TTW placed the winning bid on license A in round 133. Because this bid was not challenged thereafter, TTW could not switch to any of the licenses C to E, which may have given rise to an inefficiency. However, the price for license A remained constant after period 133 while the prices for licenses C to E continued to rise. Therefore, it seems difficult to imagine that TTW would have wanted to switch to a smaller licence after period 133.

To conclude, I think that the writing of Börgers and Dustmann is very interesting and important in better understanding the actual bidding behavior in real auctions with high stakes. However, I am less skeptical than the authors about the efficiency of the allocation of licenses. Even if the outcome were inefficient, this would not seem to be due to the rules of the auction that was employed in the United Kingdom but rather to the environment in which the auction had to be conducted.

## Notes

I would like to thank Tilman Börgers and participants at the CESifo conference on Spectrum Auctions and Competition in Telecommunication in Munich on November 22–23, 2001, for helpful comments.

1. Börgers and Dustmann (2002) define efficiency as follows: "We use the term efficiency here in the following sense: licenses are allocated to maximize the sum of the valuations of licence holders, subject to the constraint that each bidder can hold only one license" (6).

## Reference

Börgers, T., and C. Dustmann. 2002. "Strange Bids: Bidding Behaviour in the United Kingdom's Third Generation Spectrum Auction." Mimeo., University College London.

I offer an explanation for some of the bidding in the year 2000 British 3G telecom auction and observe that Börgers and Dustmann's (chapter 8) results are consistent with the outcome having been efficient.

## 10.1 Introduction

Börgers and Dustmann (chapter 8) is a very valuable and insightful chapter that is full of useful detail about the actual bidding in the U.K. 3G auction and will become a key reference for anyone studying it.

As discussed in Klempere (2002a; chapter 15) and Binmore and Klempere (2002), the U.K. auction was one of the most successful of the western European 3G auctions. Indeed in terms of revenue raised per capita it was the most successful of all the auctions, and it is therefore appropriate to examine, as Börgers and Dustmann do in chapter 8, whether the auction's outcome was also as efficient as is often claimed. Furthermore, Börgers and Dustmann draw attention to many previously unnoted features of the bidding in the U.K. auction that do not fit well with standard theory and that may have important implications for future auctions.

I have learned a lot from Börgers and Dustmann's analysis. In what follows, I discuss just two issues of which my interpretation is slightly different.

## 10.2 Efficiency of the U.K. Auction

Börgers and Dustmann's analysis makes clear that an ascending auction like that of the United Kingdom runs the risk of an at least slightly inefficient outcome arising in some circumstances. However, it also seems clear that the actual outcome of the U.K. auction was efficient, or